

CLAIMS

What is claimed is:

- 1 1. A electroosmotic pump comprising:
 - 2 a. at least one porous structure for pumping fluid therethrough, the porous
 - 3 structure having a first side and a second side and having a first
 - 4 continuous layer of electrically conductive porous material having an
 - 5 appropriate first thickness disposed on the first side and a second
 - 6 continuous layer of electrically conductive porous material having a
 - 7 second thickness disposed on the second side, wherein at least a portion of
 - 8 the porous structure is configured to channel flow therethrough; and
 - 9 b. means for providing electrical voltage to the first layer and the second
 - 10 layer to produce an electrical field therebetween, wherein the means for
 - 11 providing is coupled to the first layer and the second layer.
- 1 2. The electroosmotic pump according to claim 1 further comprising means for
- 2 generating power sufficient to pump fluid through the porous structure at a
- 3 desired rate, wherein the means for generating is coupled to the means for
- 4 providing.
- 1 3. The electroosmotic pump according to claim 1 wherein the porous structure
- 2 includes a plurality of fluid channels extending between the first side and the
- 3 second side.
- 1 4. The electroosmotic pump according to claim 1 wherein the first side and the
- 2 second side are roughened.

- 1 5. The electroosmotic pump according to claim 3 wherein the plurality of fluid
2 channels are in a straight parallel configuration.
- 1 6. The electroosmotic pump according to claim 3 wherein the plurality of fluid
2 channels are in a non-parallel configuration.
- 1 7. The electroosmotic pump according to claim 3 wherein at least two of the
2 plurality of fluid channels are cross connected.
- 1 8. The electroosmotic pump according to claim 1 wherein the electrically
2 conductive porous material is disposed as a thin film electrode.
- 1 9. The electroosmotic pump according to claim 1 wherein the electrically
2 conductive porous material is disposed as a screen mesh having an appropriate
3 electrically conductivity.
- 1 10. The electroosmotic pump according to claim 1 wherein the electrically
2 conductive porous material includes a plurality of conductive beads having a first
3 diameter in contact with one another to pass electrical current.
- 1 11. The electroosmotic pump according to claim 10 wherein at least one of the
2 plurality of beads has a second diameter larger than the first diameter.
- 1 12. The electroosmotic pump according to claim 1 wherein a predetermined portion
2 of the continuous layer of electrically conductive porous material has a third
3 thickness.

1 13. The electroosmotic pump according to claim 12 wherein the predetermined
2 portion of the continuous layer is disposed on the surface of the porous structure
3 in one or more desired patterns.

1 14. The electroosmotic pump according to claim 13 wherein at least one of the
2 desired patterns further comprises a circular shape.

1 15. The electroosmotic pump according to claim 13 wherein at least one of the
2 desired patterns further comprises a cross-hatched shape.

1 16. The electroosmotic pump according to claim 13 wherein at least one of the
2 desired patterns further comprises a plurality of parallel lines.

1 17. The electroosmotic pump according to claim 1 wherein at least a portion of an
2 outer region of the porous structure is made of fused non-porous glass.

1 18. The electroosmotic pump according to claim 1 wherein the first thickness is
2 within the range between and including 200 Angstroms and 10,000 Angstroms.

1 19. The electroosmotic pump according to claim 1 wherein the second thickness is
2 within the range between and including 200 Angstroms and 10,000 Angstroms.

1 20. The electroosmotic pump according to claim 1 wherein the electrically
2 conductive porous material is Platinum.

1 21. The electroosmotic pump according to claim 1 wherein the electrically
2 conductive porous material is Palladium.

- 1 22. The electroosmotic pump according to claim 1 wherein the electrically
2 conductive porous material is Tungsten.
- 1 23. The electroosmotic pump according to claim 1 wherein the electrically
2 conductive porous material is Copper.
- 1 24. The electroosmotic pump according to claim 1 wherein the electrically
2 conductive porous material is Nickel.
- 1 25. The electroosmotic pump according to claim 1 further comprising an adhesion
2 material disposed in between the electrically conductive porous material and the
3 porous structure.
- 1 26. The electroosmotic pump according to claim 1 wherein the first layer and the
2 second layer is made of the same electrically conductive porous material.
- 1 27. The electroosmotic pump according to claim 1 wherein the first layer and the
2 second layer is made of different electrically conductive porous materials.
- 1 28. An electroosmotic porous structure adapted to pump fluid therethrough, the
2 porous structure comprising a first side and a second side, the porous structure
3 having a plurality of fluid channels therethrough, the first side having a first
4 continuous layer of electrically conductive porous material deposited thereon and
5 the second side having a second continuous layer of electrically conductive
6 porous material deposited thereon, the first layer and the second layer coupled to
7 a power source, wherein the power source supplies a voltage differential between
8 the first layer and the second layer to drive fluid through the porous structure at a
9 desired flow rate.

- 1 29. The electroosmotic porous structure according to claim 28 wherein the plurality
2 of fluid channels extend from the first side to the second side in a straight parallel
3 configuration.
- 1 30. The electroosmotic porous structure according to claim 28 wherein the plurality
2 of fluid channels extend from the first side to the second side in a non-parallel
3 configuration.
- 1 31. The electroosmotic porous structure according to claim 28 wherein at least two of
2 the plurality of fluid channels are cross connected.
- 1 32. The electroosmotic porous structure according to claim 28 wherein the
2 electrically conductive porous material is a thin film electrode.
- 1 33. The electroosmotic porous structure according to claim 28 wherein the first layer
2 of electrically conductive porous material is a screen mesh.
- 1 34. The electroosmotic porous structure according to claim 28 wherein the
2 electrically conductive porous material further comprises a plurality of conductive
3 beads having a first diameter in contact with one another to pass electrical
4 current.
- 1 35. The electroosmotic porous structure according to claim 34 wherein at least one of
2 the plurality of beads has a second diameter larger than the first diameter.
- 1 36. The electroosmotic porous structure according to claim 28 wherein a
2 predetermined portion of the continuous layer of electrically conductive porous
3 material has a third thickness.

- 1 37. The electroosmotic porous structure according to claim 36 wherein the
2 predetermined portion of the continuous layer is disposed on the surface of the
3 porous structure in one or more desired patterns.
- 1 38. The electroosmotic porous structure according to claim 28 wherein at least a
2 portion of an outer region of the porous structure is made of fused non-porous
3 glass.
- 1 39. The electroosmotic porous structure according to claim 28 wherein the continuous
2 layer has a thickness within the range between and including 200 Angstroms and
3 10,000 Angstroms.
- 1 40. The electroosmotic porous structure according to claim 28 wherein the
2 electrically conductive porous material is Platinum.
- 1 41. The electroosmotic porous structure according to claim 28 wherein the
2 electrically conductive porous material is Palladium.
- 1 42. The electroosmotic porous structure according to claim 28 wherein the
2 electrically conductive porous material is Tungsten.
- 1 43. The electroosmotic porous structure according to claim 28 wherein the
2 electrically conductive porous material is Nickel.
- 1 44. The electroosmotic porous structure according to claim 28 wherein the
2 electrically conductive porous material is Copper.

1 45. The electroosmotic porous structure according to claim 28 further comprising an
2 adhesion material disposed in between the electrically conductive porous material
3 and the porous structure.

1 46. A method of manufacturing an electroosmotic pump comprising the steps of:
2 a. forming at least one porous structure having a first side and a second side
3 and a plurality of fluid channels therethrough;
4 b. depositing a first continuous layer of electrically conductive porous
5 material of appropriate first thickness to the first side adapted to pass fluid
6 through at least a portion of the portion of the first layer; and
7 c. depositing a second continuous layer of electrically conductive porous
8 material of appropriate second thickness to the second side adapted to pass
9 fluid through at least a portion of the second layer.

1 47. The method according to claim 46 wherein the plurality of fluid channels extend
2 from the first side to the second side in a straight parallel configuration.

1 48. The method according to claim 46 wherein the plurality of fluid channels extend
2 from the first side to the second side in a non-parallel configuration.

1 49. The method according to claim 46 further comprising the steps of:
2 a. coupling a power source to the first continuous layer and the second
3 continuous layer; and
4 b. applying an appropriate amount of voltage to generate a substantially
5 uniform electric field across the at least one porous structure.

1 50. The method according to claim 49 wherein the power source is coupled to the
2 first and second continuous layers via a pair of wires.

- 1 51. The method according to claim 46 wherein the layer of electrically conductive
2 porous material is a thin film.
- 1 52. The method according to claim 46 wherein the electrically conductive porous
2 material is a screen mesh.
- 1 53. The method according to claim 52 further comprising the step of mechanically
2 clamping the screen mesh to the porous structure.
- 1 54. The method according to claim 46 wherein the layer of electrically conductive
2 porous material includes a plurality of conductive beads in contact with one
3 another.
- 1 55. The method according to claim 46 wherein a predetermined portion of the layer
2 of electrically conductive porous material has a third thickness.
- 1 56. The method according to claim 46 wherein at least a portion of an outer region of
2 the porous structure is made of fused non-porous glass.
- 1 57. The method according to claim 46 wherein the first thickness is within the range
2 between and including 200 Angstroms and 10,000 Angstroms.
- 1 58. The method according to claim 46 wherein the second thickness is within the
2 range between and including 200 Angstroms and 10,000 Angstroms.
- 1 59. The method according to claim 46 wherein the electrically conductive porous
2 material is Platinum.

- 1 60. The method according to claim 46 wherein the electrically conductive porous
2 material is Copper.
- 1 61. The method according to claim 46 wherein the electrically conductive porous
2 material is Palladium.
- 1 62. The method according to claim 46 wherein the electrically conductive porous
2 material is Tungsten.
- 1 63. The method according to claim 46 wherein the electrically conductive porous
2 material is Nickel.
- 1 64. The method according to claim 46 further comprising the step of depositing an
2 adhesion material to a surface of the electrically conductive porous material.
- 1 65. The method according to claim 46 further comprising an adhesion material
2 disposed in between the electrically conductive porous material and the second
3 side of the porous structure.
- 1 66. The method according to claim 46 wherein the electrically conductive porous
2 material is applied by an evaporation process.
- 1 67. The method according to claim 46 wherein the electrically conductive porous
2 material is applied by a vapor deposition process.
- 1 68. The method according to claim 46 wherein the electrically conductive porous
2 material is applied by a screen printing process.

- 1 69. The method according to claim 46 wherein the electrically conductive porous
2 material is applied by a spraying process.
- 1 70. The method according to claim 46 wherein the electrically conductive porous
2 material is applied by a sputtering process.
- 1 71. The method according to claim 46 wherein the electrically conductive porous
2 material is applied by a dispensing process.
- 1 72. The method according to claim 46 wherein the electrically conductive porous
2 material is applied by a dipping process.
- 1 73. The method according to claim 46 wherein the electrically conductive porous
2 material is applied by a spinning process.
- 1 74. The method according to claim 46 wherein the electrically conductive porous
2 material is applied as a conductive ink.
- 1 75. The method according to claim 46 wherein the electrically conductive porous
2 material is applied by a patterning process.
- 1 76. The method according to claim 46 wherein the electrically conductive porous
2 material is applied by a shadow masking process.